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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
CHANG, AUDREY Y	
ART UNIT	**PAPER NUMBER**
2872	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	03/15/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 03/15/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/500,461	TOMOYOSHI, ITO	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 4-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 4-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Remark

- This Office Action is in response to applicant's amendment filed on January 16, 2007, which has been entered into the file.
- By this amendment, the applicant has amended claims 1 and 7.
- Claims 1, and 4-11 remain pending in this application.

Response to Amendment

1. The amendments filed on **August 10, 2006 and January 16, 2007** are objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows: **claim 1 has been amended** to include the phrase "*the light emitting diode array including three light-emitting diodes arranged respectively on a two-dimensional grid pattern*", **claim 7 has been amended** to include the phrase "*LEDs arranged on a two dimensional grid pattern*" and **claim 7 has been amended (in August 10, 2006 amendment)** to include the phrase "*the light beams are projected to the half mirror spatially shifted from each other and onto the reflective liquid crystal display*".

The specification **fails to disclose** that the LEDs are arranged on a two-dimensional grid pattern. Also, as stated in the previous Office Action, the specification simply fails to disclose that the light beams from the light sources are "spatially shifted or offset" on the half mirror. On the contrary the arrangements shown in Figures 1 and 2 will **ensure** the light beams from the color light sources to be incident on the half mirror and the reflective liquid crystal display coincidently with no spatial offset or spatial shift.

The applicant respectfully noted that Figures 9 and 10 of the instant application, do not show a two dimensional grid pattern for LEDs, in fact no light emitting diodes are shown or discussed with respect Figures 9 and 10.

Applicant fails to provide arguments concerning new matters objection to the claim 7 concerning the feature "*light beams are projected to the half mirror spatially shifted from each other and onto the reflective liquid crystal display*".

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. **Claims 1and 4-11 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The reasons for rejections based on the newly added matters are set forth in the paragraph above.

4. **Claims 7-11 are rejected under 35 U.S.C. 112, first paragraph**, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification and the claims **fail** to teach how could the colors of light being incident on the half mirror "*spatially shifted from each other*" as recited **in claim 7**, when the light beams combiner arrangements ensure the colors of light coincide with each other before incident on the half mirror (HM3).

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1, 4 and 7-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Kato et al (PN. 5,852,504) in view of the patents issued to Sekiguchi et al (PN. 5,798,864) and Popovich et al (PN. 6,115,152).

Kato et al teaches a *holographic image display* that is comprised of a *computer* for calculating phase information from three dimensional coordinate data of *objects* (Figures 1-2) to create *computer generated hologram fringe information* wherein the phase information or computer generated holographic fringe information is provided by a *controller* (138, Figure 28) to a ***reflective*** *spatial light modulator* (130, **Figure 28**) such as a *liquid crystal display device*, (Figure 26, column 12, lines 7-10) to display the computer generated holographic *fringe* information on the ***reflective*** liquid crystal display device. Kato et al teaches that a *semiconductor laser light source* (134) is used to illuminating the reflective liquid crystal display **via** a *half mirror* (142) such that a three dimensional image of the objects, (objects used for calculating the computer generated holographic fringe information) is reconstructed from the reflective liquid crystal display device and is *projected* by the *half mirror* to an observer, (please see

Figure 28, columns 11-12). The data of the three-dimensional object used for creating the computer-generated hologram is externally obtained, (please see Figures 6-7). The controller or the computer is connected to the reflective liquid crystal display, (please see Figure 28).

This reference has met all the limitations of the claims. This reference however does not teach explicitly to use a pinhole filter and a collimator lens disposed between the light source and the half mirror, however this reference does teach that *collimated* light is used to illuminate the liquid crystal display device. Kato et al in a different embodiment teaches that a *pinhole filter* (for creating point light source) and a *collimator lens* (216 or 218, Figure 35) can be used to create *collimated illumination* light beam to illuminate the liquid crystal display device. **Sekiguchi** in the same field of endeavor also teaches to use *pinhole filter* and *collimator lens* (202a, Figure 9) between the laser light source and the half mirror for creating *collimated illumination light beam* for illuminating the display device, for displaying a computer generated Fraunhofer diffraction image (which can be one form of computer generated holographic image). It would then have been obvious to one skilled in the art to apply the teachings to modify the holographic image display device of Sato et al to use pinhole filter and collimator lens to *effectively* create the *collimated* illumination beams needed.

With regard to the feature concerning "that the parallel light that illuminate the display is formed from three light-emitting diodes emitting three primary light at the same time and the colors of the light incident on the half mirror", recited in claim 1, both **Kato et al** and **Sekiguchi** teach a *full color display* wherein three light sources each generating one primary color of light are being used to illuminate the display via half mirror for the reflective mode of the display, (please see Figure 36 of **Katò** et al and Figure 9 of **Sekiguchi**). However these references teach to use laser light sources but do not teach *explicitly* that the light emitting diodes are used as the light sources. **Kato** et al in fact teaches that the light sources are *semiconductor laser* that emitting red, green or blue light respectively, (please see column 11, lines 40-60), one skilled in the art would understand that a semiconductor laser **is essentially**

a light emitting diode light sources for they all based on semiconductor p-n junction for emitting the light. **Popovich** et al in the same field of endeavor teaches that either laser diode (semiconductor laser) of light emitting diodes, (LEDs) may be used to illuminate a reflective holographic display to provide the reconstructed full color holographic image, (please see column 21, line 28 to column 22, line 6). It would then have been obvious to one skilled in the art to apply the teachings of **Popovich** et al to modify the display device of **Kato** et al to use high power LEDs as the light sources for producing the full color images for the benefit of using bright light sources with high output power and narrow bandwidth to improve the image quality.

Claims 1 and 7 have been amended to include the phrase that the "light emitting diode array including three light-emitting diodes arranged respectively on a two-dimensional grid pattern" or "LEDs arranged on a two-dimensional pattern". This feature is rejected under 35 USC 112, first paragraph, as newly submitted matters, since the specification fails to provide support for such. Kato et al teaches that the three light sources, (for generating red, blue and green light respectively), are arranged in a two-dimensional array manner. One skilled in the art would understand in order for each of the light beam to illuminate the spatial light modulator (SLM, 200, 202, 204, Figure 36), arranged in two dimensional manner, the light sources have to be arranged also in two dimensional manner, (i.e. the semiconductor light sources (206, 208, 210) have to be aligned with the optical axes of the SLM respectively), since the collimating light beams from the three light sources will not be able to turn direction by themselves or by SLM to form the orthogonal arranged light beams as they incident on the half mirror. Further, as shown by both **Kato et al and Sekiguchi references**, the geometric arrangement of the three color light sources really do not affect the operation of the display device, since either to place them in two dimensional arrangement or linear arrangement, the **same function** can be achieved namely, providing parallel three color light beams incident on the half mirror to be combined to form a full color image as the display.

With regard to amended claim 7 (amendment filed on August 10, 2006), concerning the color light beams incident on the half mirror spatially offset from each other, the specification **fails** to support for such feature. **Kato** et al and **Sekiguchi** et al teach that when the different color of lights are intended to illuminate the *whole* display surface, the colors of light are not offset from each other. **Popovich** et al teaches when the color light beams are intended to illuminate *different* section of the display surface, the incidences of the light beams are spatially offset from each other. It would then have been obvious to one skilled in the art to apply the teachings of the Popovich et al to modify the incident locations of the light beams when different sections of the display surface are intended to be illuminated by different light beam.

The cited Kato et al, Sekiguchi and Popovich et al reference all teach that the full color reconstructed image is formed by combining the images of the corresponding colors.

With regard to claim 4, Sekiguchi teaches that a field lens is used to project the image, (please see Figure 9).

With regard to claim 9, concerning the feature that the three color light sources are being placed in the specifically claimed arrangement, **Kato** et al teaches that the three color light sources (R, G, B) are being placed at vicinity of each other for providing *a combined* color light via the half mirror. The demonstration in Figure 36, makes the light sources are arranged not in orthogonal directions from each other, however one skilled in the art with the common knowledge would understand they have to be in orthogonal direction arrangement in order for the collimated light from the light sources illuminate the display properly. **Sekiguchi** teaches the three light sources are being arranged off-axis from each other to provide a combined color light to illuminate the display device. Furthermore, one skilled in the art must understand the arrangement for the light source to provide combined color light really poses no patentable distinctions with respect to prior art arrangements, since they do not change the functions of the light

sources namely producing the combined color images to the viewer, such modification therefore is considered to be obvious matters of design choice to one skilled in the art.

With regard to claim 11, it is implicitly true that the size of reconstruction area which is the size of illumination areas of the light sources is determined by the geometric relationship between the pinhole filter, the collimator lens, the display device and the field lens.

7. Claims 5-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Kato et al, Sekiguchi and Popovich et al as applied to claim 1 above, and further in view of the patent issued to Hashimoto (PN. 5,515,183).

The holographic image display device taught by **Kato** et al in combination with the teachings of **Sekiguchi** as described for claim 1 above have met all the limitations of the claims. Both Kato et al and Sekiguchi teaches a holographic display device for displaying *computer-generated hologram* that are calculated and created by a computer. It is implicitly true that processing system is included for distributing the holographic fringe information to the liquid crystal display device for display. **Hashimoto** in the same field of endeavor further teaches a *real time* holography system wherein *parallel processing units* are used to distribute and therefore display the holographic information on a liquid crystal display, (please see Figure 5). High speed processing is certainly needed for achieving *real time* holography display. It would then have been obvious to one skilled in the art to apply the teachings of **Hashimoto** to include a high-speed parallel processing unit for distributing and displaying the holographic information on the liquid crystal display for the benefit of achieving the accuracy and the speed needed for the holographic display.

Response to Arguments

8. Applicant's arguments filed on January 16, 2007 have been fully considered but they are not persuasive. The newly amended claims have been fully considered and they are rejected for the reasons stated above.

9. In response to applicant's argument concerning the light emitting diodes disclosed by cited Popovich reference is a linear array, the examiner respectfully disagrees for the reasons stated below. The emitting diode array disclosed by Popovich reference as shown in Figures 19, 20a and 20b, really cannot be identified as "linear array". The individual light sources are actually off set from each other in two dimensional manner, since the applicant fails to disclose, in the instant application, light emitting diodes are arranged in two dimensional grid pattern and fails to disclose what exactly is the grid pattern, the arguments are not persuasive to overcome the rejection. Furthermore, applicant's arguments concerning the cited Kato et al reference discloses that the three color light sources are arranged in linear pattern, the examiner respectfully disagrees for the reasons stated below. Figure 36 of Kato et al reference is just an illustration figure. **The applicant being one skilled** in the art would have the general knowledge that in order for the collimated light beams from the three light sources to illuminate the spatial light modulator (200, 202, 204) respectively and to provide **orthogonal arranged parallel color lights** to incident on the half mirror (220 and 222) and be combined as color image light to the observer (224), the semiconductor laser light sources (206, 208 and 210) has to be **aligned** with the **optical axes** of the SLM (200, 202 and 204) respectively, since the collimating lens and the spatial light modulators DO NOT have the function to turn the light beam to be orthogonal arranged afterwards. **Kiyomoto** et al (PN. 5, 768,026) is provided as evidence to show the common and proper arrangement of the color LED sources in two dimensional pattern to provide collimated and parallel light beams incident on a half mirror so that the parallel and collimated light beams be combined to form color image light, (please see Figure 1). This shows that the three color light sources of Kato et al (Figure 36) have to be aligned with the optical axes of the SLM and

therefore the orthogonal directions with respect to the half mirror in order to provide the full color image light as shown in Figure 36.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. US patent issued to **Kiyomoto** et al (PN. 5, 768,026) is provided as evidence to show the common and proper arrangement of the color LED sources in two dimensional pattern to provide collimated and parallel light beams incident on a half mirror so that the parallel and collimated light beams be combined to form color image light, (please see Figure 1).

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephone B. Allen can be reached on 571-272-2434. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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